

This listing of claims will replace all prior versions, and listings of claims in the application:

Listing of Claims:

1 1. (Currently Amended) A mass spectrometer probe ~~that is removably~~
2 ~~insertable into a mass spectrometer, the probe comprising a substrate having a surface coated~~
3 ~~with silicon oxide and a hydrogel material on the surface, wherein the hydrogel material~~
4 ~~comprises a water-insoluble and water-swellable polymer, having absorbed at least 10 times its~~
5 ~~own weight of a liquid, that is crosslinked and is at least about 10 microns thick and further~~
6 ~~comprises binding functionalities for binding with an analyte detectable by the mass~~
7 ~~spectrometer.~~

1 2. (Original) The probe of claim 1 wherein the substrate is in the form of a
2 strip or a plate.

1 3. (Previously presented) The probe of claim 1 wherein the substrate
2 comprises an electrically conducting material.

1 4. (Original) The probe of claim 1 wherein the surface of the substrate is
2 conditioned to adhere the hydrogel material.

1 5. (Canceled)

1 6. (Original) The probe of claim 1 wherein the surface of the substrate is
2 rough, porous or microporous.

1 7. (Canceled)

1 8. (Currently Amended) The probe of claim 1 wherein the hydrogel material
2 is in situ polymerized on the ~~silicon oxide coating~~ surface by depositing a solution comprising

3 monomers onto the glass coating, wherein the monomers are pre-functionalized to provide
4 binding functionalities.

1 **9.-10.** (Canceled)

1 **11.** (Original) The probe of claim 1 wherein the hydrogel material is in the
2 form of a discontinuous pattern.

1 **12.** (Canceled)

1 **13.** (Original) The probe of claim 1 wherein the hydrogel material is
2 continuous and has one or two-dimensional gradient of one or more of the binding
3 functionalities.

1 **14.** (Original) The probe of claim 1 wherein a plurality of different hydrogel
2 materials comprising different binding functionalities are on the surface of the substrate.

1 **15.** (Original) The probe of claim 1 wherein the hydrogel material is a
2 homopolymer, a copolymer, or a blended polymer.

1 **16.** (Original) The probe of claim 1 wherein the hydrogel material is derived
2 from substituted acrylamide monomers, substituted acrylate monomers, or derivatives thereof.

1 **17.** (Original) The probe of claim 1 wherein the binding functionalities attract
2 the analyte by salt-promoted interactions, hydrophilic interactions, electrostatic interactions,
3 coordinate interactions, covalent interactions, enzyme site interactions, reversible covalent
4 interactions, nonreversible covalent interactions, glycoprotein interactions, biospecific
5 interactions, or combinations thereof.

1 **18.** (Original) The probe of claim 1 wherein the binding functionalities of the
2 hydrogel material are selected from the group consisting of a carboxyl group, a sulfonate group,
3 a phosphate group, an ammonium group, a hydrophilic group, a hydrophobic group, a reactive

4 group, a metal chelating group, a thioether group, a biotin group, a boronate group, a dye group,
5 a cholesterol group, and derivatives thereof.

1 **19.** (Previously presented) The probe of claim 18 wherein the binding
2 functionalities comprise a carboxyl group and the hydrogel material is derived from monomers
3 selected from the group consisting of (meth)acrylic acid, 2-carboxyethyl acrylate, N-acryloyl-
4 aminohexanoic acid, N-carboxymethylacrylamide, 2-acrylamidoglycolic acid, and derivatives
5 thereof.

1 **20.** (Previously presented) The probe of claim 18 wherein the binding
2 functionalities comprise a sulfonate group and the hydrogel material is derived from
3 acrylamidomethyl-propane sulfonic acid monomers or derivatives thereof.

1 **21.** (Previously presented) The probe of claim 18 wherein the binding
2 functionalities comprise a phosphate group and the hydrogel material is derived from N-
3 phosphoethyl acrylamide monomers or derivatives thereof.

1 **22.** (Previously presented) The probe of claim 18 wherein the binding
2 functionalities comprise an ammonium group and the hydrogel material is derived from
3 monomers selected from the group consisting of trimethylaminoethyl methacrylate,
4 diethylaminoethyl methacrylate, diethylaminoethyl acrylamide, diethylaminoethyl
5 methacrylamide, diethylaminopropyl methacrylamide, aminopropyl acrylamide, 3-
6 (methacryloylamo)propyltrimethylammonium chloride, 2-aminoethyl methacrylate, N-(3-
7 aminopropyl)methacrylamide, 2-(t-butylamino)ethyl methacrylate, 2-(N, N-dimethylamino)ethyl
8 (meth)acrylate, N-(2-(N, N-dimethylamino))ethyl (meth)acrylamide, N-(3-(N, N-
9 dimethylamino))propyl methacrylamide, 2-(meth)acryloyloxyethyltrimethylammonium chloride,
10 3-methacryloyloxy-2-hydroxypropyltrimethylammonium chloride, (2-acryloyloxyethyl)(4-
11 benzoylbenzyl)dimethylammonium bromide, 2-vinylpyridine, 4-vinylpyridine, vinylimidazole,
12 and derivatives thereof.

1 **23.** (Previously presented) The probe of claim 18 wherein the binding
2 functionalities comprise a hydrophilic group and the hydrogel material is derived from
3 monomers selected from the group consisting of N-
4 (meth)acryloyltris(hydroxymethyl)methylamine, hydroxyethyl acrylamide, hydroxypropyl
5 methacrylamide, N-acrylamido-1-deoxysorbitol, hydroxyethyl(meth)acrylate,
6 hydroxypropylacrylate, hydroxyphenylmethacrylate, polyethylene glycol monomethacrylate,
7 polyethylene glycol dimethacrylate, acrylamide, glycerol mono(meth)acrylate, 2-hydroxypropyl
8 acrylate, 4-hydroxybutyl methacrylate, 2-methacryloxyethyl glucoside, poly(ethyleneglycol)
9 monomethyl ether monomethacrylate, vinyl 4-hydroxybutyl ether, and derivatives thereof.

1 **24.** (Previously presented) The probe of claim 18 wherein the binding
2 functionalities comprise a hydrophobic group and the hydrogel material is derived from
3 monomers selected from the group consisting of N, N-dimethyl acrylamide, N, N-diethyl
4 (meth)acrylamide, N-methyl methacrylamide, N-ethyl methacrylamide, N-propyl acrylamide, N-
5 butyl acrylamide, N-octyl (meth)acrylamide, N-dodecyl methacrylamide, N-octadecyl
6 acrylamide, propyl (meth)acrylate, decyl (meth)acrylate, stearyl (meth)acrylate, octyl-
7 triphenylmethylacrylamide, butyl-triphenylmethylacrylamide, octadecyl-
8 triphenylmethylacrylamide, phenyl-triphenylmethylacrylamide, benzyl-
9 triphenylmethylacrylamide, and derivatives thereof.

1 **25.** (Previously presented) The probe of claim 18 wherein the binding
2 functionalities comprise a metal chelating group and the hydrogel material is derived from
3 monomers selected from the group consisting of N-(3-N, N-biscarboxymethylamino)propyl
4 methacrylamide, 5-methacrylamido-2-(N, N-biscarboxymethylamino)pentanoic acid, N-
5 (acrylamidoethyl)ethylenediamine N, N', N'-triacetic acid, and derivatives thereof.

1 **26.** (Previously presented) The probe of claim 18 wherein the binding
2 functionalities comprise a reactive group and the hydrogel material is derived from monomers
3 selected from the group consisting of glycidyl acrylate, acryloyl chloride, glycidyl(meth)acrylate,

4 (meth)acryloyl chloride, N-acryloxysuccinimide, vinyl azlactone, acrylamidopropyl pyridyl
5 disulfide, N-(acrylamidopropyl)maleimide, acrylamidodeoxy sorbitol activated with bis-
6 epoxirane compounds, allylchloroformate, (meth)acrylic anhydride, acrolein, allylsuccinic
7 anhydride, citraconic anhydride, allyl glycidyl ether, and derivatives thereof.

1 **27.** (Previously presented) The probe of claim 18 wherein the binding
2 functionalities comprise a thioether group and the hydrogel material is derived from thiophilic
3 monomers selected from the group consisting of 2-hydroxy-3-mercaptopyridylpropyl
4 (methacrylate), 2-(2-(3-(meth)acryloxyethoxy)ethanesulfonyl)ethylsulfanyl ethanol, and
5 derivatives thereof.

1 **28.** (Previously presented) The probe of claim 18 wherein the binding
2 functionalities comprise a biotin group and the hydrogel material is derived from biotin
3 monomers selected from the group consisting of N-biotinyl-3-(meth)acrylamidopropylamine and
4 derivatives thereof.

1 **29.** (Previously presented) The probe of claim 18 wherein the binding
2 functionalities comprise a boronate group and the hydrogel material is derived from boronate
3 monomers selected from the group consisting of N-(m-dihydroxyboryl)phenyl (meth)acrylamide
4 and derivatives thereof.

1 **30.** (Previously presented) The probe of claim 18 wherein the binding
2 functionalities comprise a dye group and the hydrogel material is derived from dye monomers
3 selected from the group consisting of N-(N'-dye coupled aminopropyl) (meth)acrylamide and
4 derivatives thereof.

1 **31.** (Previously presented) The probe of claim 18 wherein the binding
2 functionalities comprise a cholesterol group and the hydrogel material is derived from
3 cholesterol monomers selected from the group consisting of N-cholesteryl-3-
4 (meth)acrylamidopropylamine and derivatives thereof.

1 **32.-75** (Canceled)

1 **76.** (Currently Amended) The probe of claim 1 wherein the binding
2 functionality is ~~attached to said surface via a moiety that is derived from~~ a reactive group
3 selected from an epoxide and a carbonyldiimidazole.

1 **77.** (Canceled)

1 **78.** (Previously presented) The probe of claim 1 wherein the hydrogel
2 material comprises cellulose or dextran.

1 **79.** (Previously presented) The probe of claim 1 wherein the surface is
2 substantially smooth.

1 **80.** (Canceled)

1 **81.** (Previously presented) The probe of claim 1 wherein the substrate
2 comprises an insulating material.

1 **82.** (Currently Amended) The probe of ~~any of~~ claims 1-4, 6-11, 13-31 or 76-
2 84 wherein the surface of the substrate is conditioned with a coupling agent and the hydrogel
3 material adheres to the surface through a covalent interaction with the coupling agent.

1 **83.** (Currently Amended) The probe of ~~any of~~ claims 1-4, 6-10, 14-31 or 76-
2 84 wherein the hydrogel is attached to the surface in a plurality of discontinuous spots.

3 **84.** (Previously presented) The probe of claim 82 wherein the coupling agent
4 is a silane-based agent.

1 **85.** (Previously presented) The probe of claim 82 wherein the hydrogel is
2 attached to the surface in a plurality of discontinuous spots.

1 **86.-93.** (Canceled)

1 94. (New) The probe of claim 1 wherein the hydrogel material is derived
2 from 3-(methacryloylamino)propyltrimethylammonium chloride monomers.

1 95. (New) The probe of claim 1 wherein the hydrogel material is derived
2 from 2-acrylamidoglycolic acid monomers.

1 96. (New) The probe of claim 1 wherein the hydrogel material is derived
2 from N-(acrylamidoethyl)ethylenediamine N, N', N'-triacetic acid monomers.

1 97. (New) The probe of claim 18 wherein the surface of the substrate is
2 conditioned with a silane-based coupling agent and the hydrogel material adheres to the surface
3 through a covalent interaction with the coupling agent.

1 98. (New) The probe of any of claims 1-4, 6, 8, 11-31, 76, 78-86 and 94-97
2 wherein the substrate comprises a metal having a thickness at least 0.5 mm.

1 99. (New) The probe of claim 98 wherein the substrate comprises a silicon
2 oxide coating.

1 100. (New) The probe of claim 98 wherein the hydrogel material is in situ
2 polymerized on the surface of the substrate.

1 101. (New) The probe of claim 98 wherein the substrate comprises a silicon
2 oxide coating.

1 102. (New) The probe of claim 100 wherein the substrate comprises a silicon
2 oxide coating.

1 103. (New) The probe of claim 98 wherein the hydrogel material is in situ
2 polymerized on the surface of the substrate.